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TI: **Observed Weather Satellite Thermal IR Responses Prior to Earthquakes**

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AB: A number of observers claim to have seen thermal anomalies prior to earthquakes, but subsequent analysis by others have failed to produce similar findings. It was the purpose of this study to determine if thermal anomalies could be found in association with known earthquakes by systematically co-registering weather satellite images at the sub-pixel level and then determining if statistically significant responses had occurred prior to an event. Earthquakes associated with plate movement (strike-slip and thrust faulting), rather than volcanism, were to be considered. A new set of automatic co-registration procedures were developed for this task to accommodate all properties particular to weather satellite observations taken at night. Spacecraft and sensor ephemeris and the horizontal displacement due to elevation were all factored in, and final adjustments for minor satellite deviations (related to roll, pitch, and yaw) were made by using image-to-image tiepoint correlations. Reliance upon visual clues in an image (frequently the subject of debate in the past) is not required. The technique relies on the general condition where ground cools after sunset. The technique applies best to the use of the geosynchronous weather satellites (GOES, Meteosat, and GMS), where images are taken every thirty minutes. Use of the geosynchronous satellites also reduces the potential for miscalculation of trends due to weather front movement or local cloud/fog formation. The polar orbiting satellites have better resolution (1km vs 5km) and better signal-to-noise, but only acquire images twice during an evening, thereby making trend analysis difficult. Case studies investigated to date include the Hector Mine California and Ikrit Turkey earthquakes of 1999, and the Bhuj India quake of 2001. The result of the new analytic procedures has been the observance of apparent heating trends close to epicenters in satellite data acquisitions a few hours prior to an earthquake. When observations along known fault-lines showed a much-reduced `temperature' decline through the evening, or in some cases an actual `temperature' increase, an earthquake occurred. This result may indicate mid-infrared luminescence associated with crustal deformation (Freund, 2002), rather than heat emission. Other events are currently under investigation using the methods developed.